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Research Article

Application of Digital Twin Combined with Artificial Intelligence and 5G Technology in the Art Design of Digital Museums

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More and more museums are being established or restored as people's cultural levels grow. A digital twin is a computerized representation of the physical object or phenomenon, which acts as its real-time digital equivalent. Artificial intelligence (AI) is becoming increasingly widespread, and museums and art shows will need to change their old working and thinking processes to fully fulfill their potential. In an increasingly digital world, combining AI technologies and wearable devices into digital museums could assist in boosting involvement. It is necessary to investigate AI's strategic function and application in affecting tourist experiences at art galleries and museums, as well as its potential to improve education. Also, digital twin (DT) paves the way to alleviate difficulties or might improve access to digital museums via digital experiences. The historical report recommends that digital museum items be represented in a way that poses the fewest threats to its legitimacy. Owing to its uniqueness and vulnerability to substantial environmental dangers, the safeguarding of art and cultural heritage in digital museums is a serious issue. There are many approaches for assessing the state of artistic heritage and protecting it from extreme acts. The current study offers a framework for digitized museum art design based on the utilization of digital twin (DT), artificial intelligence (AI), and fifth-generation (5G) technologies. Further to enhance the security of the system, we employ the improved blowfish encryption algorithm (IBEA). Also, the authentication is done using the Diffie-Hellman protocol. The proposed system is simulated using MATLAB, and its performance is analyzed and compared with conventional systems. From the result obtained, it was revealed that the suggested methodology express high range of security level (95%) than the existing mechanisms. This study is very important in two directions: (1) it presents an analytical structure for having to adapt digital information to complicated systems in museums and (2) it explains the artistic obstacles for heritage properties, such as accessibility, execution time, security level, and the efficiency of 3-dimensional designs.

1. Introduction

People's living standards are constantly improving, and significantly new technologies are rapidly developing, resulting in a greater desire for spirituality. The establishment and publicity of museums have been stepped up to be able to suit the requirements of the populace. Conventional museums, on the other hand, depend on actual locations that might easily produce traffic and noises in the atmosphere, and some individuals are unable to access physical museums for varied purposes; therefore, digital museums develop as the situations demand. A digital twin is a virtual representation of a person's physical self that is capable of reasoning (drawing inferences), sensing (acting in real time), and acting (proposing improvements). Building Information Modelling (BIM) has some similarities to it (BIM). In contrast to digital twins, which represent how people interact with built environments, BIMs focus on the design and construction of a building. Manufacturing and maritime engineering utilize it often. The digital representation employs sensors to monitor the functioning and lifetime of equipment. The digital twin incorporates IoT, AI, machine learning, and software analytics into a single system. Digital twin is a self-learning system that utilizes a variety of different technologies. As a result, SFM is built on a digital system that integrates all devices and aids in the achievement of smart building objectives. Many devices, sensors, and software all contribute to the creation of a digital twin. According to one author, there are tremendous data management issues with the digital twin because of the need to integrate data from a wide range of autonomous and heterogeneous sources such as real-time sensors in buildings, cloud services, asset management systems, and cloud services. High-speed connection is required for digital twin applications to carry out numerous operations in real-time or quick processing times. Current wireless networks are incapable of real-time integration with a wide range of devices and sensors. The huge data connection, security, and real-time cloud processing provided by the 5G network can meet the challenges of digital twin in building technology. Virtual reality technology, 3D graphics and picture techniques, and computer networking technologies are all used in the digital museum. The three-dimensional method of the actual entity museums is shown to the museums on the networks using a stereoscopic vision system, interactive media technologies, amazing visual effect techniques, and other innovations. It offers the benefit of open surfing and intuitive communication when coupled with the introduction of digital multimedia technology. This could gather anything that could be digitized, and the data could be continuously updated and supplied operations on the networks. Through information technologies, the architecture is similar to the conventional museum category and proposes a unique manner of demonstration and touring experiences, and the entity museum coexists, which is an extended version of the physical museums and empowers the traditional expo structure of the museums [1].

The digital museum's interaction design is focused on the cognitive requirements of its visitors. It considers the recipient's sense of sight and convenience during the usage process, attempting to produce a continuous sensation for the audience to engage themselves in the procedure, allowing people to completely mobilize their passion and gain an amazing experience. The nonlegacy digital museums are a platform that caters to a variety of audiences. As a result, determining the type of information and functionality people need may aid in determining how to deliver the material and functionality [2].

Museums' incorporation into Internet technology is among the most important ways to propagate a culture that fosters social assistance. The Internet technology display is primarily focused on the Internet technology of displays and art museums, to establish a unique form of display modes with various exhibits, knowledge exchange, content coconstruction, and sharing of experiences among participants and spectators. The architecture of the Internet infrastructure idea is the cornerstone of the display, and the mix of physical and digital exhibitions must be done correctly. We may approximately summarize the characteristics of digital museums, such as the supervision of actual displays on the Web, and augment the depth of diverse display formats and immersive experiences, by looking at certain digital museums. The Internet technology museum conforms to the current trend of museum application development, provides a unique framework, and implements the networking of data collecting, multimedia content presentation, real-time information upgrading, and information experience interactivity [3].

Artificial intelligence (AI) is the process of making machines behave intelligently in the same way that people do. Human-summarized rules were used in early AI applications. Researchers compiled rules based on logic or facts based on human experience and then built programs to allow the computer to execute a task. Humans, on the other hand, find it difficult to understand the principles and explain the rules behind many intelligent activities, such as language comprehension and image identification. As a result, academics began to turn their focus on allowing computers to learn from data in order to tackle such challenges. Machine learning is the term for this type of procedure. Machine learning's major goal is to create learning algorithms that allow computers to study and extract rules from data automatically. The learnt rules, also known as models, can be utilized to create predictions and solve specific issues based on unknown data. AI approaches have been utilized to monitor structural health, diagnose superficial damage, and analyze the moisture content of walls in old buildings. Here, the main hypothesis is a theory that incorporates, among other things. To begin, a definition of "digital twin" is necessary. A new theory, the digital twin theory, has been proposed to address this issue. The digital twin theory is not only another description but also a system of assumptions aimed at improving the administration of digital twins over constructing museums. Second, a real-world testing environment is required for practitioners. Digital twin management and the building technology relationship should be shown in the test environment. Furthermore, it should be a place where building managers may experiment with their own digital twins. The pointed objective here was to integrate the digital twin with the building technology and to improve its level of security over data transfer.

In this paper, the digital twin technology is combined with the 5G and artificial intelligence technology for effective art designing of digital museums. The further part of the paper is organized as follows. Section 2 explains the literary works associated with this paper and the problem statement. Section 3 explains the proposed system. Section 4 analyzes the performance of the proposed system and compares it with the existing methodologies. And, finally, Section 5 concludes the overall idea of the paper.

2. Related Works

Zheng et al. [4] proposed a digital museum countermeasure curriculum for primary and secondary school students as a secondary classroom. They began by reviewing investigations of second classrooms associated with digital museums conducted in China and other places. They used the Zhejiang Education Technology Museum as a blueprint to create and build the Zhejiang Education Technology Digital Museum based on their findings. Next, using the notion of paired architecture, they looked at how traditional museum teaching and digital museum teaching performed. Lastly, they conducted a questionnaire poll to assess people's perceptions of the Zhejiang Education Technology Digital Museum.

Wu [5] detailed the process of museum digitalization and proposed the use of Internet of Things technology in the creation of a digital museum. It presents an RFID-based design process for the museum's collection development and smart guides, paving the path for the creation of a smart museum.

With a research study of Google Arts & Culture, Lee et al. [6] attempt to investigate how digital audiences are influenced by digital museum display features. This study, predicated on the idea of remediation, emphasizes interaction through interfaces features like "Zoom-in" and "Museum View" for conveying information and "User Gallery," "Share," and "Details" for providing a fulfilling experience. The findings of this study propose approaches for museum administrators to build and maintain their organizations' user interfaces.

Through an experimental analysis comparing a digitized and a conventional museum, Elgammal et al. [7] confirmed the effect of visitor experience (VEX) on the special event, satisfaction levels, and behavioral intentions. According to the research, VEX produces better effects in terms of memory and behavioral intents in the context of digitized museums. This research highlights the relevance of exploring the museums to create an experienced cultural framework, as well as giving proof for the vital function of digital technologies. Despite the abundance of research on travel experiences, few investigations have looked at the role of VEX in museum administration, and none have compared the influence of VEX on recognizability, comfort, and perceived behavioral control in digital and traditional museums. As a result, this research contributes both theoretically and practically by extending to the body of knowledge in this area.

Cassidy et al. [8] suggested that the significance of community museum in the digital collections of natural and cultural resources should be addressed. It emphasizes the role of digital museums in digital collections and suggests a virtualized museum design. The infrastructure tackles necessity for high-quality local connections, which allow maintenance as well as the need for a worldwide system that made the results available and facilitates the formation of community relationships.

Tong and Ma [9] focused on the real issues that arise when conventional museums' essential duties of collecting, administration, preservation, investigation, presentation, teaching, and popularization and public utilities are realized, by compiling modern digital museum benchmarks, analyzing novel aspects of online museums both domestically and globally, elaborating the objective of digital museums, suggesting the design and growth of digital museums focused on "life experiences," discovering digital museum construction standards, and encouraging industry agreement and standardized management of digital museum design.

Grincheva [10] researched the "GuggenTube" phenomena that were created as a consequence of a partnership between Google and the Solomon R. Guggenheim Foundation to commemorate YouTube's fifth anniversary. It provides a discussion of the 2010 YouTube Play creative video competition that included user-generated material from around the globe to encourage contemporary video cultures in museums. YouTube Play is among the few digital museum initiatives with a broad worldwide breadth and impact, although it was launched about a decade earlier. Thousands of online participants and millions of supporters from all over the globe flocked to the digital site. It sparked several arguments about the roles and functions of modern museums and also the meanings and usefulness of arts, among website visitors.

Xu and Mi [11] suggested a new digitized museum visualization system associated with big data technologies. The platform fully integrates the benefits of big data technology into the museum's information collection, collecting, interpretation, evaluation, and preservation procedure, as per the features of museums' large datasets. Depending on this, the design allows extensive usage of modern visualization technology and can display museum big data processing and analysis outcomes to clients in a variety of formats. The findings suggest that the system can help conventional museums modernize and upgrade, as well as boost their social and economic benefits.

Valtysson and Holdgaard [12] provided a theoretical and practical perspective of museum arts and artifact reuse via social media platforms, as well as how this reuse places museums in a domain of conflict between political and economic logic and imaginative autonomy. The section looks at digital museum communications through the lens of the museums as a charged place, alluding to the museum's historic, social, and political relevance as an organization that creates, preserves, and communicates the shared identity, history, and tradition.

Wiastuti et al. [13] aimed to explore the digitized conformance of the Jakarta museum concerning the definition of available data. In addition, this research examines millennials' attitudes regarding museums' digital technology usage. To label the study design, the Taman Mini Indonesia Indah website was used. As a result, as of this focus of study, 18 museums had been established. Information was acquired via direct field observation and interviews with museum professionals at all museums. Simultaneously, research containing a questionnaire was circulated to seek feedback on the museum's digital technologies and access to data. A descriptive study was also used to acquire additional available information. The results demonstrate that written materials, digital documents, multimedia contents, websites, programs, self-service terminals, and signs are all available. The results also reveal that Museum Olahraga is the most compliant in terms of offering available data and digitization tools including immersive online signage, augmented reality, interactive video mapping, automated screen sliders, interacting kiosks, and interacting light show.

Mason [14] contributes to the conversation by examining how the combination of multiple design features might

Table 1: Existing analysis.

References	Algorithm	Advantage	Disadvantages
[1]	Review analysis	Deep information retrieval	—
[2]	Research analysis	Deep information retrieval	—
[3]	Research analysis	Deep information retrieval	—
[4]	Research analysis	Deep information retrieval	—
[5]	Research analysis	Deep information retrieval	—
[6]	Research analysis	Deep information retrieval	—
[7]	Research analysis	Deep information retrieval	—
[8]	Research analysis	Deep information retrieval	—
[9]	Research analysis	Deep information retrieval	—
[10]	Research analysis	Deep information retrieval	—
[11]	Research analysis	Deep information retrieval	—
[12]	Research analysis	Deep information retrieval	—
[13]	Research analysis	Deep information retrieval	—
[14]	Research analysis	Deep information retrieval	—
[15]	Research analysis	Deep information retrieval	—
[16]	Research analysis	Deep information retrieval	—
[17]	Research analysis	Deep information retrieval	—
[18]	Research analysis	Deep information retrieval	—
[19]	Data source	Free data source	—
[20]	Blow fish	High security	Less accuracy
[21]	RSA	Less computation time	Low security
[22]	AES	High range of accuracy	Low security

aid in the creation of museum computing environments that combine online and physical aspects. They suggest a theoretical platform, which incorporates a sequence of design features expressed by interrelated areas that are placed at different "stages of design"—from the more ideological level of experience design to communication design and data infrastructure and finally to the detailed level of interface design—based on the evaluation of exhibition works. The value of the cognitive tool they present comes from the fact that developing the customer experiences for mixed exhibition spaces is a complicated task, which necessitates the coordination of various parts. By methodically combining analogical and technological aspects through a shared cognitive tool as a point of reference for all important aspects included in the design, this methodology may assist architectural decisions by analyzing diverse design features and their interconnections.

Huiying and Jialiang [15] created a virtual reality-based digitized reality software application for Chinese classical equipment. It outlines the management approaches, procedures, and requirements for linked activities. It serves as a benchmark for the use of virtual reality simulation technologies in the area of cultural heritage stewardship.

The usage of avatar technologies as an engagement approach in digital museum settings was mentioned by Markopoulos et al. [16]. It moreover includes required functionality, a navigational procedure, and execution possibilities for these technologies' adoption. The implementation of this strategic approach has the potential to revolutionize the art world, benefit the museum's long-term viability, and provide the audience with new learning and entertaining opportunities.

Evrard and Krebs [17] provided a theoretical assessment of the "real" and "virtual" museum experiences. Using a recently developed evaluation method adds to the knowledge if the two situations are substitutes or complements. Moreover, the paper wants to contribute to the current debate on the atmosphere of arts and the validity of cultural experiences in the digital world.

In the region around and inside the cathedral, Ranieri et al. [18] did a detailed geological study utilizing ground penetrating radar (GPR), three-dimensional ERT, and seismic investigation. The hypogeum's walls and floors were also inspected. The study revealed multiple buried artifacts in the hypogeum's vicinity and a few other spaces that are most likely existing close to the hypogeum.

There are several methods published over digital twin technology but most of them are review analysis, but it lacks implementation; hence, to fill out the research gaps, here we are implementing a novel algorithm to integrate the digital twin over BIM (Table 1).

2.1. Problem Statement. Owing to the worldwide economic crises (2007–2017) and recent lockdowns caused by the COVID-19 (2020) outbreak, the artwork business, particularly museums, art exhibitions, and auction sites, has been stagnant over the previous few years. Several art institutions have used digital tools and moved their activities to the digital art world. Communication with other customers with comparable passions is a feature of art show trips. As a result, internet art places should emulate the atmosphere of real art galleries and provide similar chances. Hence, this paper uses digital twin technology integrated with 5G technology for the art design of digital museums.

3. Proposed Work

There has been a complete and broad growth from the preservation of cultural artifacts to the exhibition of digital applications in the area of cultural heritages with the extension of the breadth and depth of digital applications in the area of cultural identity. From graphical and picture collection to 3D scanning and perhaps even holographic projection technology, the gathering of historical artifact information has advanced significantly. Web page technologies, virtual reality (VR), and three-dimensional restorations are all examples of networking display methods. Most of these technologies rely on a connection with high bandwidth and low latency, as well as on the power of the cloud. Many of these new-age technologies are hindered by the present wireless networks (e.g., Wi-Fi, 4G, and 3G) that enable them. The following are a few of the most important issues:

(a) With a stronger focus on the integration of BIM with FM, the future SFM will primarily use BIM as a visualization and information source model. In addition, high bandwidth is needed to facilitate smooth real-time analysis of emerging FM technologies like AR/VR/MR, image analytics, drones, computer vision, and cloud computing. Consistent high-bandwidth service is not available on the existing wireless networks

(b) Latency is the time it takes for a device to send and receive data before it can be used. Future cloud-based systems, AR/VR/MR, drones, and computer vision will all need low latency. Weak latency requirements cannot be met by wireless networks already in use today. Thus, the integration is designed for low-bandwidth purposes

One of the strategic growth areas of museum digitizing is a network application that can resolve the issue that offline display halls have. The suggested digital twin, which is incorporated with 5G networks, is discussed in this section. The suggested system is depicted schematically in Figure 1. Data from many departments that are presently siloed on one screen will be linked together via digital twin technology, allowing workers to swiftly discover and fix issues. The museum may utilize the data they acquire to better inform how they manage the collection and the atmosphere for visitors by improving their use of information.

4. Initialization of the 5G Network

The 5G framework is set up at the start of the procedure. Lower latency, stability, and ultrahigh velocities are just a few of the advantages of 5G networks. Such lower latency opens up new possibilities for augmented and virtual reality technologies in a museum. Individuals may no longer be constrained by bandwidth or geography. Independent artists and arts organizations may be able to experiment with immersive technologies that can connect anybody at any time or place with fewer technological obstacles if 5G is applied more broadly across sectors. Low latency is essential for a clear connection and presentation of the interactive experiences, and 5G has a good chance of providing a remarkably consistent, quicker connectivity. It is supposed to alleviate network congestion because it is substantially better at delivering larger volumes of data. Users are allowed to enjoy a greater, more seamless, and much more dependable experience thanks to 5G. It would also allow the most complex tasks to be realized that would have been unachievable previously due to high file sizes and network issues.

4.1. Data Collection. The very first artwork was collected by the Museum of Modern Art (MoMA) in 1929, the year it was founded. The museum's growing collection now includes about 200,000 pieces from all around the globe that cover the previous 150 years. Paintings, sculptures, printmaking, drawings, photographs, architectures, designs, films, and multimedia, and performance art are among the many forms of visual representation presented in the collections. MoMA is dedicated to assisting everybody in comprehending, enjoying, and utilizing the collections. The portal of the museum has 71,456 artworks by 20,814 artists. This investigation dataset includes 129,241 records, which reflect every one of the artworks added to the MoMA collections and cataloged in the databases. It contains basic metadata for every artwork, such as the titles, artists, date of creation, medium, measurements, and date of acquisition by the museum [19].

4.2. Data Platform. The data platform gathers information from the sensors deployed at the museum and database of cultural establishments, subsequently combines, analyzes, simulates, visualizes, administers, and preserves the information, according to the conceptual framework of the digital twin-based creation of the digital museum.

4.3. Digital Twin Technology. Digital twins use multiple sensing devices supplied by 5G to represent the real environment and networks with the same architecture in the virtual environment, allowing surveillance, simulations, information visualization, service authentication, and service involvement in the appropriate physical environment. The data platform's data is captured by the digital twin, which is then used for surveillance, visualization, scheduling, simulations, validation, and operations. The digitized museum's design is produced using this method. Lastly, to encounter digital twin-based services tailored to user data, the authenticating procedure is carried out via multimodal devices like cellphones.

4.4. Authentication Using the Diffie-Hellman Protocol. Diffie-Hellman groupings are commonly employed in cryptography algorithms that require shared secret keys. Under the presumption that they are executed with prime-order Diffie-Hellman groupings, such algorithms are often shown to be safe. The most widely used public key system is the Diffie-Hellman key exchange protocol (DHKEP) that allows two people to agree on a secret key that is exchanged

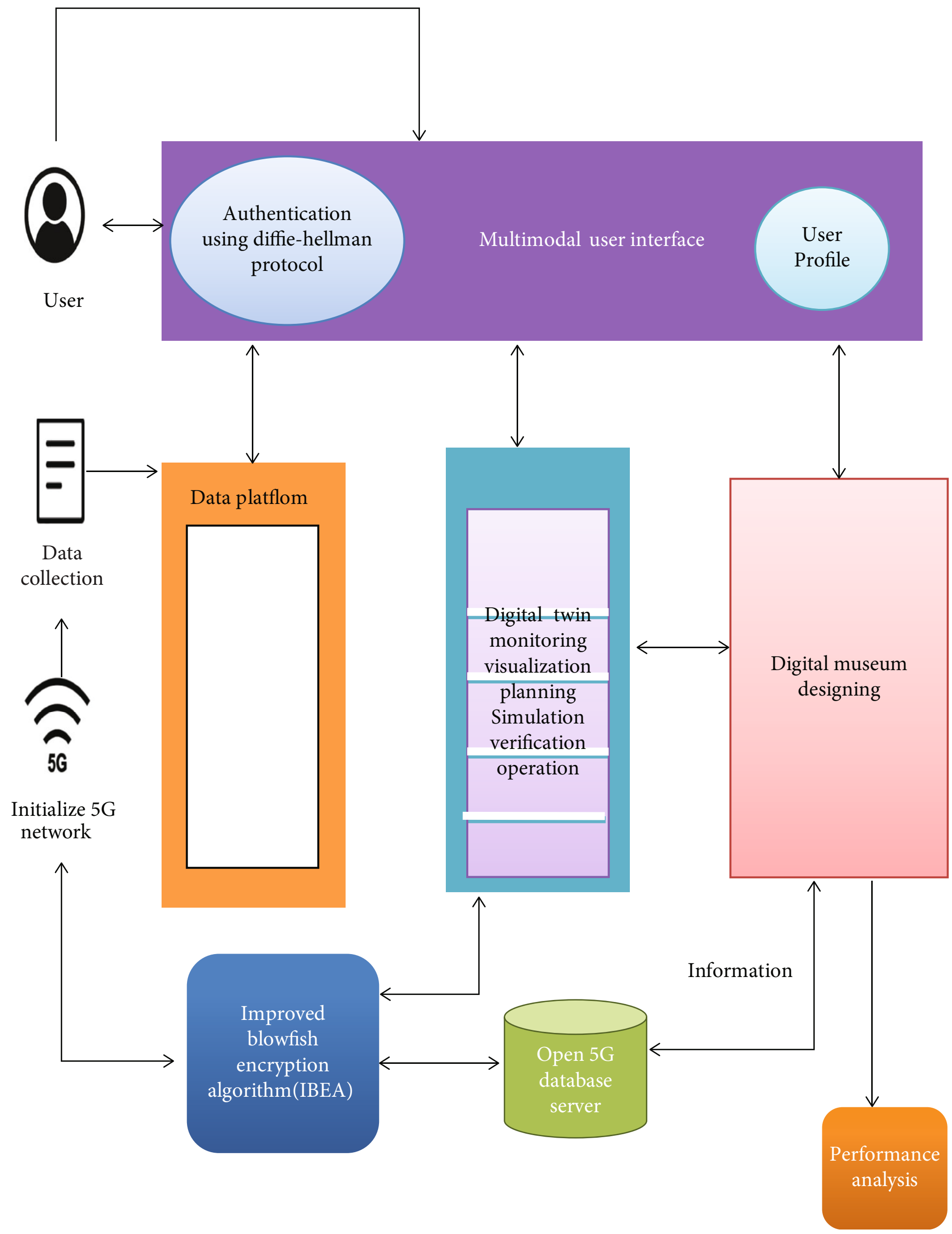

Figure 1: Architecture of the proposed system.

between them while only exchanging plaintexts through unsecure routes. The following is how trivial DHKEP works:

Two users, Alice (A) and Bob (B), desire to speak with one another. A randomly selects a secret key, Y_a, and B chooses Y_b in the first stage, and both estimate the DH public parameters as stated in

$$a = g^{Y_a} \,(\text{mod } p), \tag{1}$$

$$b = g^{Y_b} (\text{mod p}). \tag{2}$$

Here, g is a huge prime integer and p is a generator of a large-order group. The open variables "a" and "b" are then exchanged, and the shared secret key K is computed, which could be used for future interactions. The secret key K can be computed using the following formula:

$$K = \left(g^{Y_b}\right)^{Y_a} (\text{mod } p) = \left(g^{Y_a}\right)^{Y_b} (\text{mod } p) = \left(g^{Y_a Y_b} (\text{mod } p)\right). \tag{3}$$

Figure 2 shows how communication works in the DHKEP.

4.5. Improved Blowfish Encryption Algorithm (IBEA). The improved blowfish encryption method is a data encryption algorithm that is utilized in the 5G system architecture. It has a private key that allows it to encode and decode information. The main focus of this study is on converting data into an incomprehensible format using the blowfish encryption method.

It is a symmetrical technique, which means it encrypts and decrypts the information using the same keys. Those

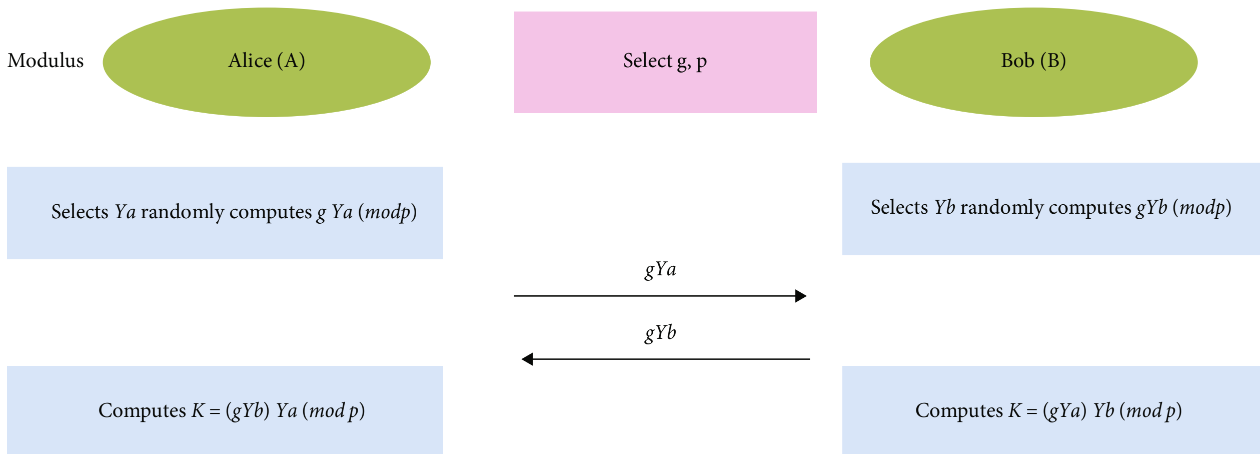

Figure 2: Diffie-Hellman key exchange protocol.

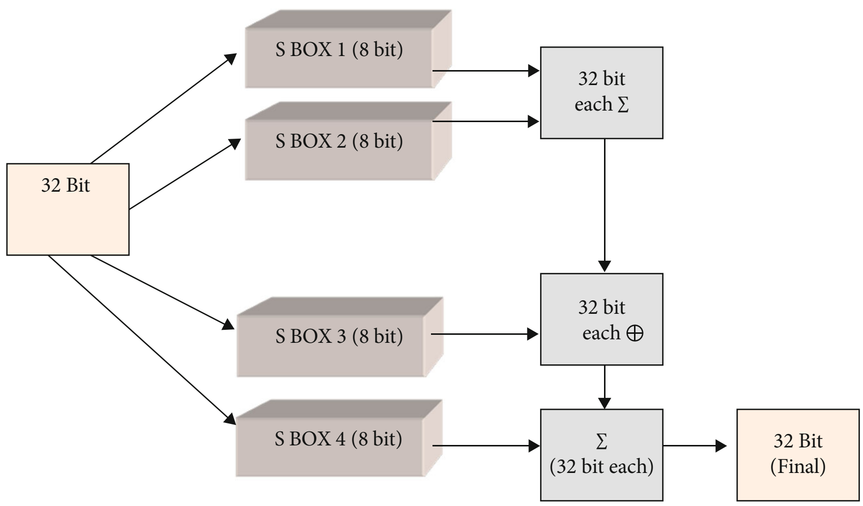

Figure 3: Encrypting data with the improved blowfish encryption algorithm.

who want to store their data in the 5G system can use this method to trade data as per their preferences. A 5G user is the owner of the data that will be delivered to the 5G ecosystem; also, they contain encrypted messages (M).

Encryption of messages necessitates the use of a key (K). The cryptography approach is based on an improved blowfish technique. HTTPS, a secure communication standard, is used to send the encrypted file to the 5G system. The 5G network's network operator is aware of messages that are incomprehensible to an intruder. Although the encrypted messages can be decrypted, the key is incomprehensible to the invader/attacker.

With the same 5G foundation, they provide the data owner with a different form of protection. The block size is 64 bits, and messages that are longer than 8 bytes are ignored. It is divided into two sections: key expansion and data encryption.

The incoming key is transformed into many subarrays, totaling 4168 bytes, during the key expansion phase. The P array is made up of 18 32-bit boxes, while the S-boxes are made composed of 4 32-bit arrays with 256 items each. The first 32 bits of the key are XORed with P1 in the next stage (the first 32-bit box in the P array). The next 32 bits of the key are XORed with P2 and so on until all 448 bits are used.

The secret data is used using 64-bit plaintext and encoded to the 64-bit ciphertext during the data encryption step. It is split into 2 32-bit left sections, precisely like the right elements in Figure 3. Then, with ease, finish the XOR task for identically left bits and the corresponding 32-bit right elements. This technique continues till the 16th round is completed.

The F function and data encryption convey 4 32-bit S-boxes, each of which has 256 entries. The fundamental 32-bit left halves of the improved blowfish approach are separated into four 8-bit blocks, like a, b, c, and d. Equation (4) shows the calculation for the F function.

$$F(\mathrm{LH}) = ((\mathrm{Sb1}, a + \mathrm{Sb2}, b \mod 232) \oplus \mathrm{Sb3}, c) + \mathrm{Sb4}, d \mod 232. \tag{4}$$

The Diffie-Hellman key exchange utilizing the blowfish method yields the suggested technique. The blowfish

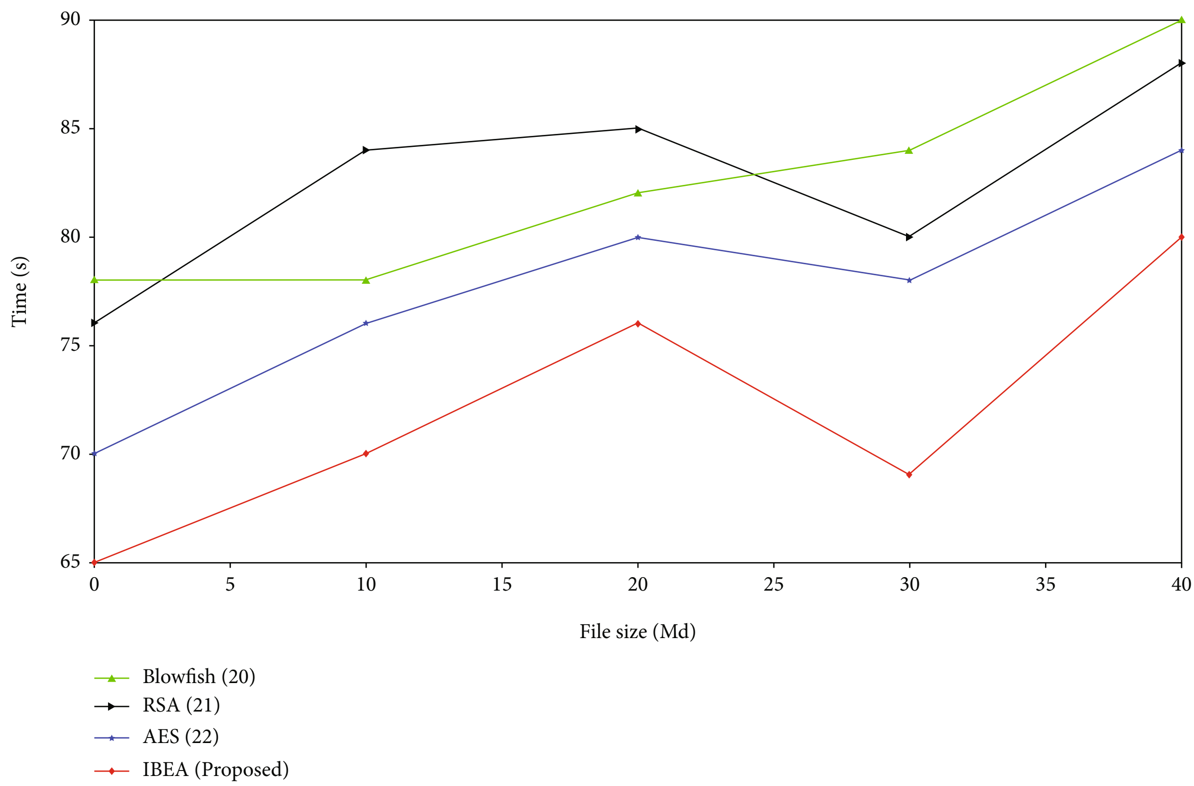

Figure 4: Comparison of encryption time for the existing and proposed method.

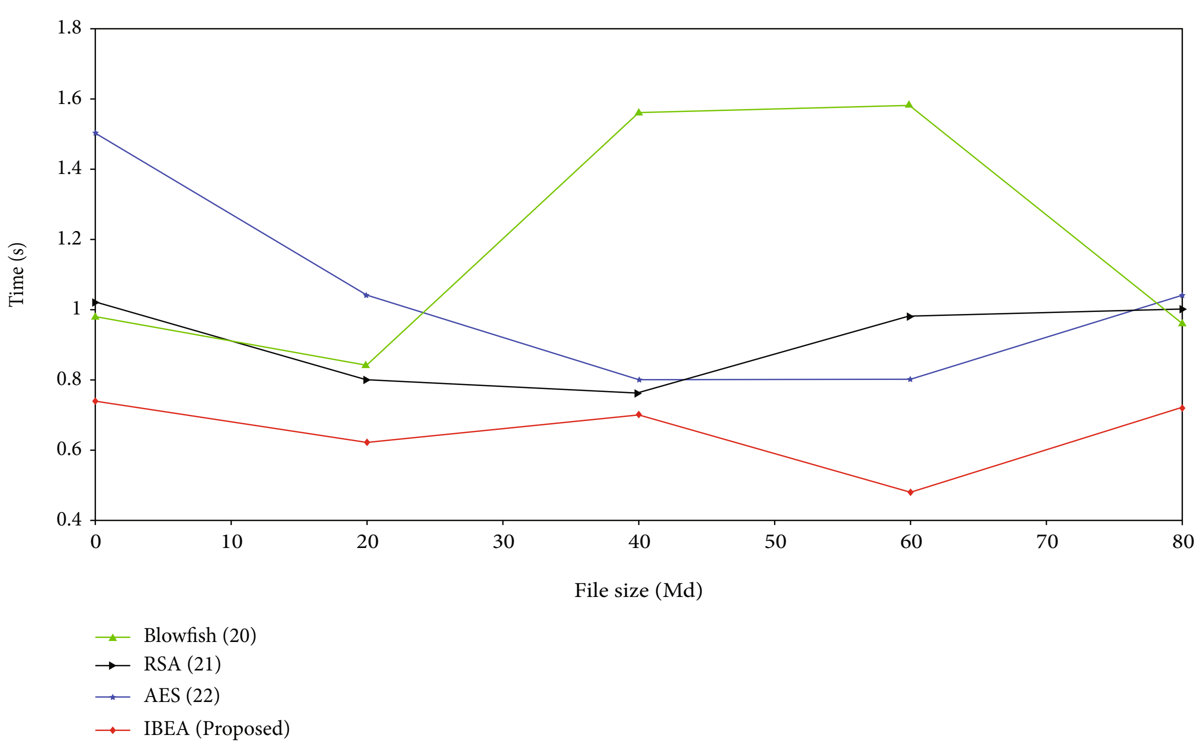

Figure 5: Comparison of decryption time for the existing and proposed method.

encryption technique replaced the old secret key calculation in the Diffie-Hellman key exchange. The suggested approach employed 136 XOR operations for every 64-bit message to encrypt data using the blowfish algorithm. Programmers used the Diffie-Hellman method to create programs that use less memory and run faster than the Diffie-Hellman key

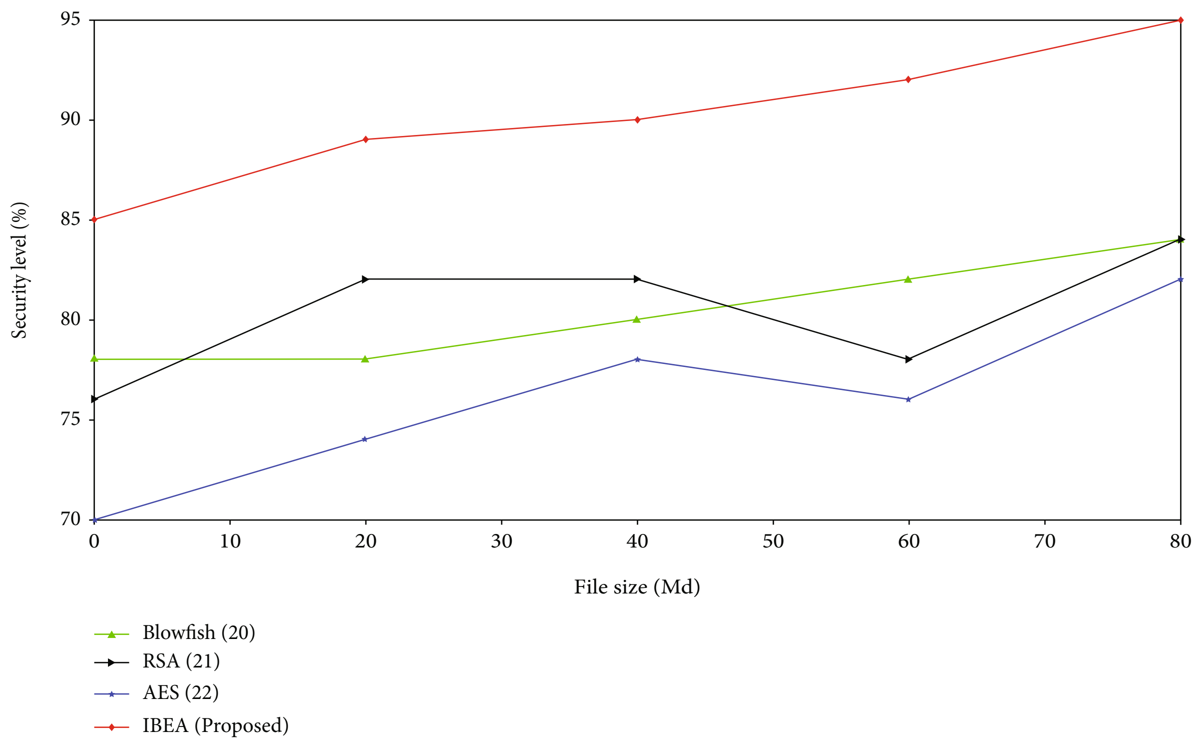

Figure 6: Comparison of security level for the existing and proposed method.

exchange program that was evaluated. Using blowfish encryption instead of secret key calculations at the core of the method might make it resistant to data attacks.

5. Performance Analysis

This section examines the suggested platform's performance and reliability. The simulation tool MATLAB was used to implement the above design. The suggested improved blowfish encryption algorithm's effectiveness is evaluated and compared to that of conventional systems such as blowfish, RSA, and AES. The time it takes to encrypt, decrypt, and execute data is reduced owing to an improved blowfish algorithm output.

Figure 4 shows a schematic diagram of encryption time for various file sizes (MB).

Figure 4 depicts a performance examination of the suggested method's encryption time for a variety of file sizes which ranges from 10 MB to 80 MB. The findings are compared to those of other methods such as blowfish, RSA, and AES. As a result of the findings, it was discovered that the suggested scheme outperforms the other techniques in terms of performance. As the degree of encryption confidentiality improves, the platform becomes capable of delivering exceptional overall effectiveness. As a result, the evaluation was focused on the encryption level of security.

Figure 5 shows the suggested technique's effectiveness and comparative study of decryption time for a variety of file sizes, which range from 10 MB to 80 MB. The results are compared to those of other approaches such as blowfish, RSA, and AES. As a result of the findings, it was discovered that the suggested technique outperforms other current techniques in terms of performance.

In Figure 6, the security level of various encryption algorithms is investigated and contrasted. Blowfish, RSA, AES, and the suggested improved blowfish encryption algorithm are among the approaches investigated. The level of security for files up to 80 MB is 95 percent for the improved blowfish, 78 percent for blowfish, 76 percent for RSA, and 70 percent for AES. Likewise, the security level is assessed for files with sizes of 20 to 80 MB. In comparison to previous encryption algorithms, the suggested algorithm delivers a high degree of protection, as seen in the graph.

Figures 7 and 8 depict the effectiveness and accuracy of the proposed and conventional methods for a variety of file sizes, including 10 MB to 80 MB. The findings are studied and compared to known methods such as blowfish, RSA, and AES. As a result of the findings, it was discovered that the provided strategy outperforms various current techniques in terms of performance.

6. Conclusion

This research is aimed at assessing the notion of digital twin (DT) and artificial intelligence (AI) technologies in connection with the implementation of museum collections in historical buildings and suggests the establishment of a 5G model that incorporates both DT and 5G principles. A workflow has also been evaluated that enables, through the construction of a synthetic dataset, shortening the time it takes to obtain the data required to train the established digital museum planning model and avoid the potential upfront expenses of sensor installation and configuration. In the lack of skilled people

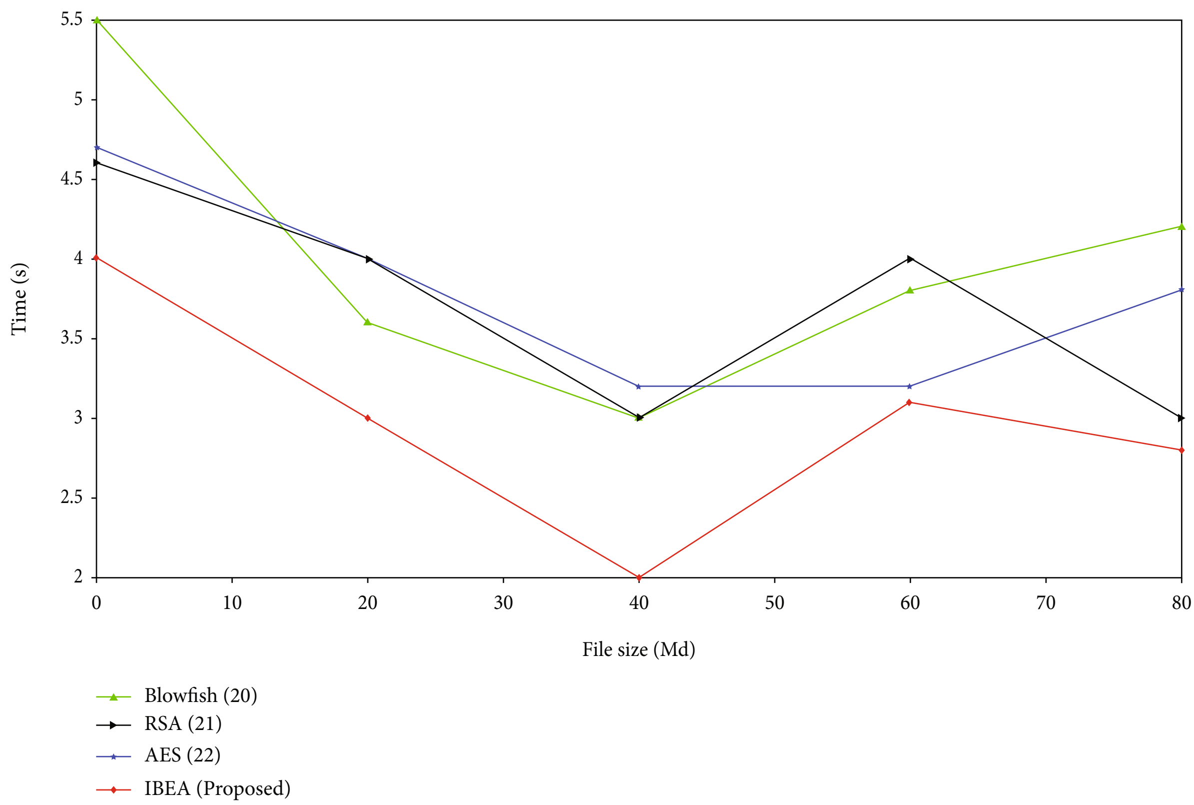

Figure 7: Comparison of execution time for the existing and proposed method.

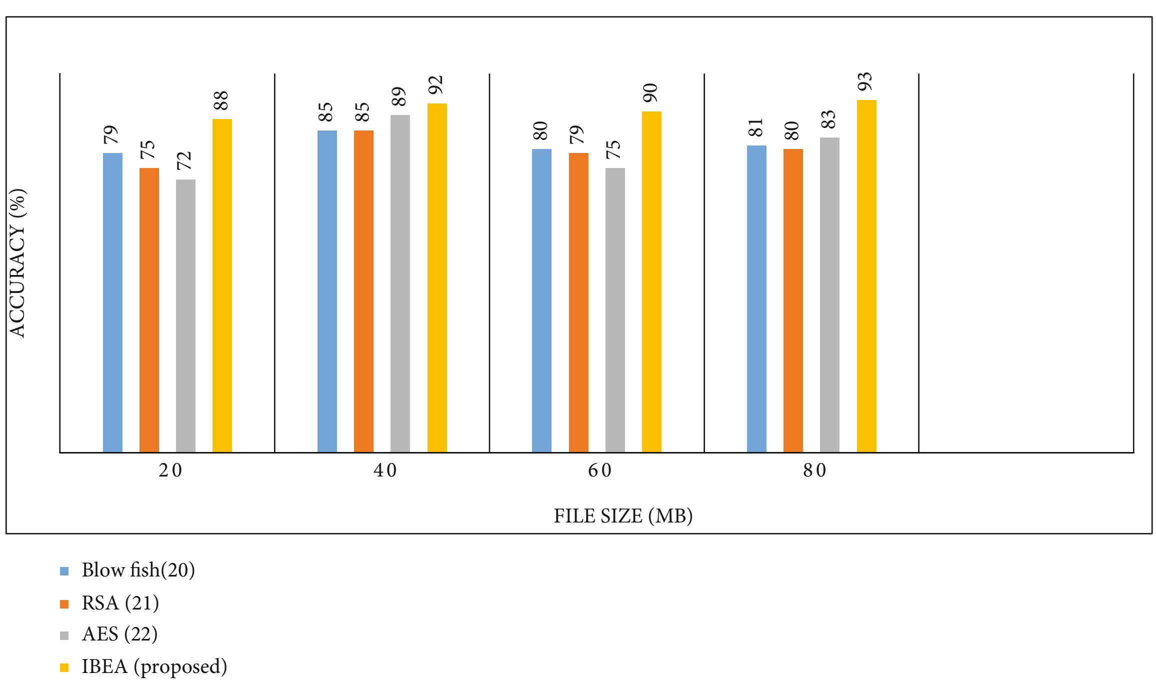

Figure 8: File size vs. accuracy.

and/or a surveillance system, the predicted benefits of this process could be seen in guaranteeing continuation in preventive conservation efforts. As an example of a physical museum, a digital museum creates virtual reality online museums using a combination of texts, images, audio, and multimedia technologies such that viewers can acquire a wealth of information while exploring, breaking the conventional museum's restrictions. As an innovative living laboratory for solving real-world business issues, the Museum 5G Lab was described in this report. Researchers at the 5G lab are working with network service providers and digital twins to build 5G use cases in conjunction with the industry. There are several disadvantages and present network-related issues that are preventing real-time and intense memory-hungry apps from running. In the example of digital twin museum technology, the article demonstrated the need for high bandwidth, low latency, and a flexible network that can accommodate a variety of network-related needs, which cannot be met by present networks. Low latency, fast bandwidth, and network slicing are just a few of the many aspects of 5G that will help businesses achieve their sustainability objectives in the future. AI-based analytics, virtualization, Internet of Things (IoT), edge computing, and cloud technologies will also be able to help solve the existing issues with mobile networks. The 5G network installation for smart museum building and smart facility management was also examined in this study comparing the proposed improved blowfish encryption algorithm to current digital museum security methods, such as RSA and AES; it gives a greater security degree of accuracy (95 percent). Aimed at increasing the efficiency and productivity while also redefining digital twin applications, these use case projects are utilizing cutting-edge state-of-the-art technologies to implement digital twins in order to achieve higher sustainability levels through reduced energy consumption and real-time monitoring and action. A 5G-based training framework established by the lab was also highlighted in the study, with comprehensive training objectives in mind for the broader adoption of 5G and future 5G issues. The simulation results reveal that the proposed IBEA increases the accuracy of digital museum data protection for all secret information while also taking lesser time to encrypt, decrypt, and execute than existing methods.

Data Availability

The experimental data used to support the findings of this study are available from the corresponding author upon request.

Conflicts of Interest

The authors declare that they have no conflicts of interest to report regarding the present study.

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